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**Subject:** Additional Comments on Chapter 6  
**Date:** Sunday, May 01, 2011 5:18:31 PM  
**Attachments:** [REVgroundwater pollution by urban stormwater.pdf](#)

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Joe Grindstaff, Executive Officer DSC

Over the weekend Dr. Jones-Lee and I had time to complete our comments on the DSC staff third draft issues devoted to groundwater pollution and urban stormwater management. As discussed in the attached supplemental comments, we have been active in these areas and have developed invited reports for the US EPA, ASCE and CVRWQCB. References to those writing and a brief summary of them are provided in the attachment. The DSC should consider this material in formulating Delta water quality management programs in these topics.

We have posted our complete, updated comments on the DSC third staff draft chapter 6 on our website, [www.gfredlee.com](http://www.gfredlee.com) as

Lee, G. F., and Jones-Lee, A., "Comments on the Delta Stewardship Council's Third Staff Draft Delta Plan – Chapter 6 Improve Water Quality to Protect Human Health and the Environment – Released April 22, 2011," Submitted to Delta Stewardship Council, Sacramento, CA, Report of G. Fred Lee & Associates, El Macero, CA, Updated May 1 (2011).

<http://www.gfredlee.com/SJR-Delta/DSCThrdStaffDraft-Com.pdf>

If you, the DSC staff, members of the DSC, or others have questions on this material, please contact me.

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Add to Groundwater pollution/stormwater management section

Following the recommendation the DSC third staff draft Chapter 6 on managing urban stormwater pollution loads quoted in another section of these comments it should be noted that this recommendation could lead to groundwater pollution through infiltration of urban stormwater into aquifer systems. The discharge of urban stormwater to shallow wells in Modesto, CA has been found to be polluting groundwaters. The CVRWQCB issued the following statement on this issue

[[http://www.ci.modesto.ca.us/pwd/docs/stormwater\\_permit.pdf](http://www.ci.modesto.ca.us/pwd/docs/stormwater_permit.pdf)]:

***“STORM WATER DISCHARGE TO SHALLOW GROUNDWATER***

*22. The Discharger uses approximately 11,000 wells, which drain approximately thirty percent of the city, to dispose of storm water. These disposal wells are lined with rock for structural safety and additional treatment. The wells are known as ‘rock wells.’*

*23. The rock wells pose a potential threat to the shallow groundwater.”*

For about 10 years Dr. Lee was a member of the American Society of Civil Engineers’ Artificial Recharge of Groundwaters standards committee. He was also a contributor to “Standard Guidelines for Artificial Recharge of Groundwater,” ASCE Standard EWRI/ASCE 34-01, Reston, VA (2001) and had the responsibility for developing the groundwater quality section of that report. One of the issues of concern is the potential for pollutants in recharge waters to pollute the groundwaters. Lee and Jones-Lee have developed several papers on this issue, including:

Lee, G. F. and Jones-Lee, A., "Water Quality Aspects of Incidental and Enhanced Groundwater Recharge of Domestic and Industrial Wastewaters," Proc. Symposium on Effluent Use Management, TPS-93-3, pp. 111-120, American Water Resources Association, Bethesda, MD (1993). <http://www.gfredlee.com/Groundwater/rechg.htm>

Lee, G. F. and Jones-Lee, A., "Water Quality Aspects of Groundwater Recharge: Chemical Characteristics of Recharge Waters and Long-Term Liabilities of Recharge Projects," IN: Artificial Recharge of Ground Water, II, Proc. Second International Symposium on Artificial Recharge of Ground Water, American Society of Civil Engineers, NY, pp. 502-511 (1995). <http://www.gfredlee.com/Groundwater/ascegwr.htm>

A special case of enhance groundwater recharge is aquifer storage and recovery (ASR) in which surface waters are injected into groundwaters for the purpose of storing the surface water in the aquifer. The injected groundwaters are subsequently pumped from the aquifer for domestic use. While that practice can be effective in enhancing domestic water supply, caution should be exercised in practicing ASR to ensure that the injected surface water does not contain pollutants that can contaminate the aquifer or lead to pollution of the injected water. The city of Tracy proposed to inject Delta Mendota Canal water into a shallow aquifer in the city using ASR with only chlorination of the water before injection. In the following report, Lee discussed concerns about that practice since the Delta Mendota canal water is derived from the polluted South Delta

water and the chlorination of that water would result in the presence of chlorination byproducts that would persist in the aquifer.

Lee, G. F. and Jones-Lee, A., "Comments on City of Tracy's Proposed Demonstration Phase Aquifer Storage and Recovery Project (ASR Demonstration Project)," Submitted to California Regional Water Quality Control Board, Central Valley Region, by G. Fred Lee & Associates, El Macero, CA, September (2004).

<http://www.gfredlee.com/Groundwater/TracyASR-comments.pdf>

Owing to those concerns he recommended that the city of Tracy not be allowed to proceed with that approach without extensive treatment of the canal water before injection. The city of Tracy was instead able to obtain high quality surface water for injection in its ASR system by constructing a pipeline to a high-quality eastside river.

Dr. Lee was an invited reviewer of the US EPA's proposed revised Class V injection well policy. Class V wells are those that are used to infiltrate surface waters and wastes into shallow aquifers. He, with Dr. Jones-Lee and S. Taylor developed findings on that issue in:

Lee, G.F., Jones-Lee, A., and Taylor, S., "Development of Appropriate Stormwater Infiltration BMPs: Part I Potential Water Quality Impacts, Monitoring and Efficacy Evaluation," Proc. of Ground Water Protection Council's 98 Annual Forum, Sacramento, CA, pp. 55-72, Sept (1998).

[http://www.gfredlee.com/Runoff/stmwt\\_infil.pdf](http://www.gfredlee.com/Runoff/stmwt_infil.pdf)

Taylor, S. and Lee, G.F., "Developing of Appropriate Stormwater Infiltration BMPs: Part II Design of Infiltration BMPs," Proc. of Ground Water Protection Council's 98 Annual Forum, Sacramento, CA, pp. 73-80, Sept (1998).

[http://www.gfredlee.com/Runoff/stmwt\\_infil2.html](http://www.gfredlee.com/Runoff/stmwt_infil2.html)

Taylor, S., and Lee, G.F., "Design of Infiltration BMPs," slides presented at GWPC 98 Annual Forum Conference, Sacramento, CA, September 20-23 (1998).

<http://www.gfredlee.com/Runoff/Infil-BMP-sli.pdf>

They discussed the potential for infiltration of urban stormwater into groundwaters to pollute groundwater. They also discussed the monitoring programs that need to be conducted to ensure that surface water infiltration BMPs do not cause groundwater pollution.

DSC should work toward developing urban stormwater management programs to reduce pollutant loads to prevent groundwater pollution by stormwater. DSC should also work toward ensuring that the recharge water used for any groundwater recharge project does not pollute the aquifer or damage aquifer quality for water storage/retrieval.

Discussions at DSC meetings have mentioned concern about how the loss of groundwater supplies such as by pollution can increase pressure to use surface waters as alternate sources. Such situations have recently occurred in Davis and Woodland, CA. The SWRCB has granted a water right to those cities to take Sacramento River water for domestic supply because the groundwaters in the areas of those cities have been polluted and/or contain pollutants of natural origin that impair the use of the groundwater as a domestic source without treatment to remove the pollutants.

Dr. Lee is familiar with the groundwater quality situation in the Davis, CA area through his work as the US EPA-supported Technical Assistance Grant (TAG) advisor to the Davis South Campus Superfund Oversight Committee (DSCSOC). The University of California Davis developed shallow, unlined landfill and pits in which to dispose campus wastes, including laboratory wastes and radioactive wastes. Even at the time that it was being practiced, it was well-known that such waste disposal measures would lead to groundwater pollution. However the UCD administration found that it was cheaper to dispose of campus wastes on its land. The pollution resulting from that practice came to be of sufficient magnitude to cause the campus area on which that waste disposal practice occurred (LEHR) to be named a national Superfund site. It is estimated that about \$50 million of state of California money is being spent in “remediation” of the LEHR Superfund site to control the groundwater polluted with chlorinated solvents (chloroform and others), chromium, and other pollutants derived from the UCD waste disposal practices.

Over the period 1995-2010 Drs. Lee and Jones-Lee issued a series of reports on technical aspects of the LEHR Superfund site investigation and remediation; their reports are available on the DSCSOC website [<http://www.gfredlee.com/DSCSOC/DSCSOC.htm>]. One of the issues they discussed is the pollution of groundwaters in the Davis area. The aquifers of that area contain naturally occurring selenium and chromium that can be present in some well waters from the aquifer. The groundwaters of the area have also been polluted by nitrate from the agricultural use of nitrogen fertilizers. That type of pollution is still occurring in that and many other areas of California. The use of Sacramento River water for domestic water supply in Davis and Woodland will put additional pressure on Delta water resources and Delta water quality.

We also added

As discussed therein, irrigated agriculture, domestic wastewater land disposal practices, dairies, feed lots, municipal landfills are all causing groundwater pollution in the Delta watershed. Irrigated agricultural practices, including drip irrigation, and areas with deep aquifers cause pollution of groundwater with salts, nitrate, and some other chemicals including some pesticides.

With respect to the SWRCB/Regional Water Boards’ permitting of municipal solid wastes landfills (MSW) that have caused groundwater pollution, in the mid-1980s while holding the position of Professor of Civil and Environmental Engineering in the University of Texas system, Dr. Lee was a consultant to the SWRCB on developing updated MSW landfilling regulations. He worked with the SWRCB staff to update landfilling regulations (Chapter 15) to require that MSW landfills be sited and constructed so as to protect groundwater quality for as long as wastes in the landfill would be a threat to pollute groundwater by landfill leachate. However, as discussed in his “flawed technology” review, the SWRCB and the Regional Boards have not, in practice, effectively enforced compliance with the requirement to ensure long-term protection of groundwater quality from pollution by landfills.